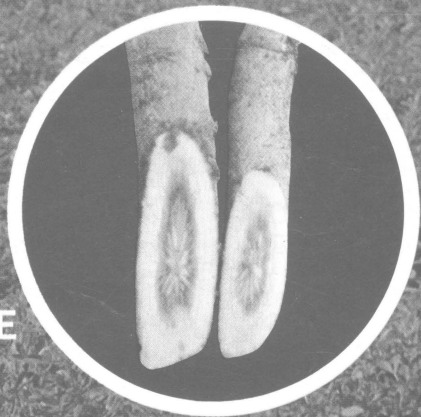


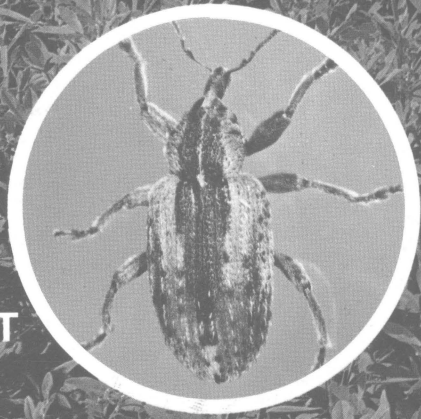
DISEASE



DEFICIENCY



INSECT



ALFALFA ANALYST

Alfalfa is a vigorous and productive crop. Like all farm crops, however, alfalfa is subject to stand injury and yield loss from disease, insect injury and nutrient deficiencies. Prompt and accurate diagnosis of a problem can allow early treatment to modify or correct the situation before yields are seriously affected or stands are lost.

The purpose of the ALFALFA ANALYST is to provide an identification guide to alfalfa diseases, nutrient deficiency symptoms and problem insects. Please use it to help identify any alfalfa problems you may have. Then secure specific up-to-date control recommendations from your local, county or state agricultural authority.

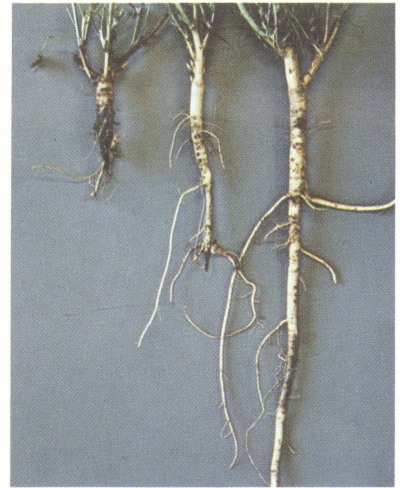
Cooperative Extension Service, THE OHIO STATE UNIVERSITY, Bulletin 547

DISEASES

An Aid To Identification



1. Bacterial Wilt



2. Phytophthora Root Rot



3. Fusarium Wilt



4. Fusarium Root Rot



5. Sclerotinia Crown and Stem Rot

Disease section prepared by F. I. Froeseiser, Plant Science Research Division, ARS, USDA and University of Minnesota. Deficiency section prepared by R. D. Munson, Potash Institute of North America. Insect section prepared by M. Curtis Wilson, Department of Entomology, Purdue University. Printed by Certified Alfalfa Seed Council, 1972.



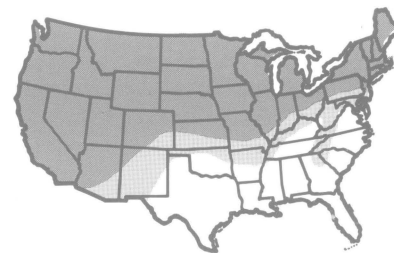
6. Anthracnose



7. Rhizoctonia Stem Blight

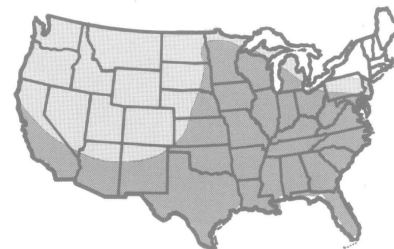
1. BACTERIAL WILT *Corynebacterium insidiosum*

First symptoms are a yellowish-brown discoloration in the woody cylinder of the tap root. This occurs in cross section as a ring under the bark and will eventually extend throughout the woody cylinder. Plants become stunted with many yellow shoots having small, cupped leaves. The bacteria are in the soil and enter through wounds.



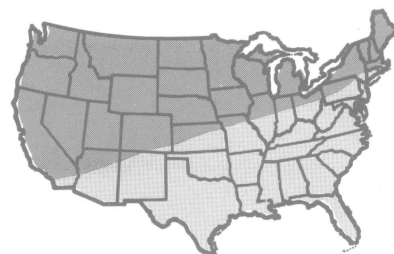
2. PHYTOPHTHORA ROOT ROT *Phytophthora megasperma*

Phytophthora root rot occurs in wet, poorly drained soils during extended periods of rainfall or excessive irrigation. It can be detected by digging surviving plants in areas where stands have been thinned. If the tap roots are rotted off, then *Phytophthora* was the likely cause of the stand loss. It causes yellowish-brown rotted areas on the roots that may extend to the crown, killing the plants. The rotted areas turn black later.



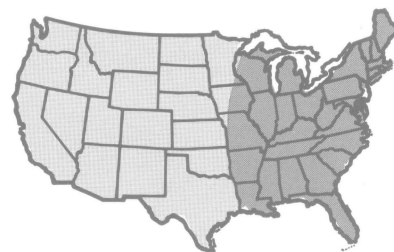
3. FUSARIUM WILT *Fusarium oxysporum*

Stems on one side of the plant wilt and die and later the entire plant dies. Brown to dark red streaks occur in the woody cylinder of the tap root. As the disease progresses, the entire outer portion of the woody cylinder becomes discolored and the plant dies. The fungus lives in the soil and enters through the small roots. Other *Fusarium* species cause root, crown and seedling rots.



4. FUSARIUM ROOT ROT *Fusarium* spp.

External symptoms are evident first in the leaves which curl at the edges, then wilt. When the tap root is cut lengthwise it is discolored light brown to black. Necrotic areas often occur in the cortex of the branch roots and tap root and are often in association with wounds. The tap root in dying plants is usually completely rotted.



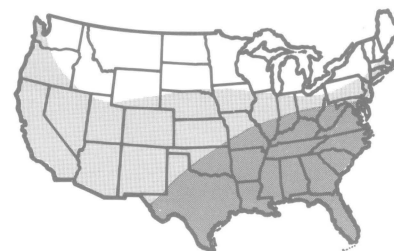
5. SCLEROTINIA CROWN AND STEM ROT *Sclerotinia trifoliorum*

The first symptoms occur in the fall as small brown spots on leaves and stems. The parts wilt and die, then the fungus spreads to the crown. In early spring the crown or basal part of the stem becomes soft and discolored. As the infected parts die a white fluffy mass grows over the area forming hard, black bodies (sclerotia) which may adhere to the surface of or be imbedded in the stem or crown.



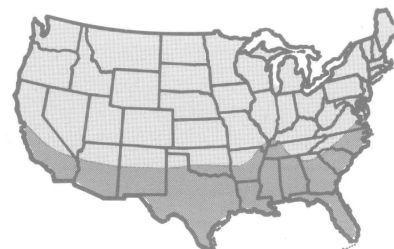
6. ANTHRACNOSE *Colletotrichum trifolii*

Diamond shaped lesions with dark borders appear on the lower portions of the stems. The centers of the lesions contain small black bodies that produce spores. The fungus may girdle and kill stems, crown buds and even the crown. The "shepherd's crook" is often observed in young dead shoots. Dead, straw colored stems scattered through the field indicate anthracnose infection and future stand loss. This disease is favored by hot, moist weather.



7. RHIZOCTONIA STEM BLIGHT *Rhizoctonia solani*

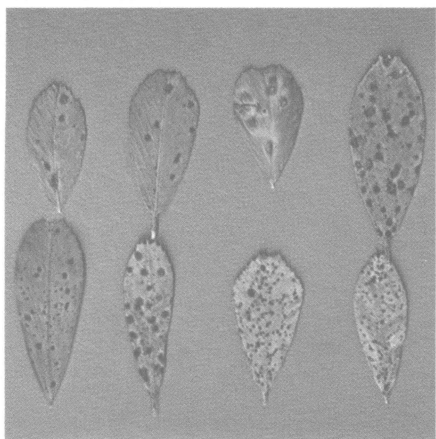
Dark, sunken cankers form near the base of the stem. The lesions often girdle and kill the stem. Dead stems scattered through a stand may indicate *Rhizoctonia* damage. The fungus also causes root, crown and seedling rot, and a foliage blight in the southeastern and southwestern states. It is most severe under high temperature and moist conditions. Most damage occurs in the southeastern and southwestern states, although it is present wherever alfalfa is grown.



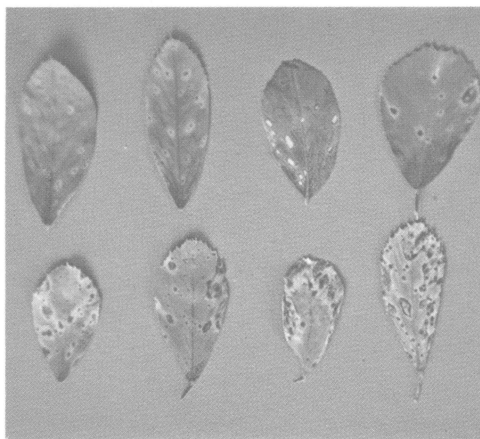
DARK GRAY AREAS — Disease usually occurs annually and affects yield, quality or persistence when susceptible varieties are grown.
LITE GRAY AREAS — Disease occurs but is of minor economic importance except occasionally in local areas.
WHITE AREAS — Disease is usually absent or of little significance.

DISEASES

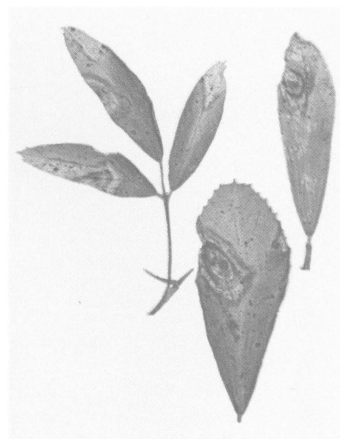
An Aid To Identification (continued)



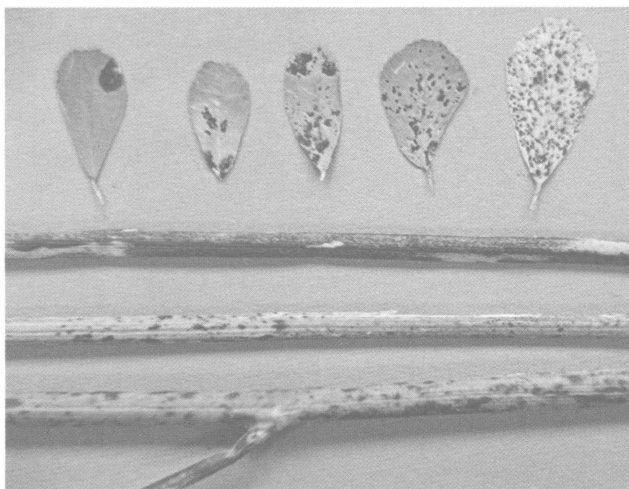
8. Common Leaf Spot



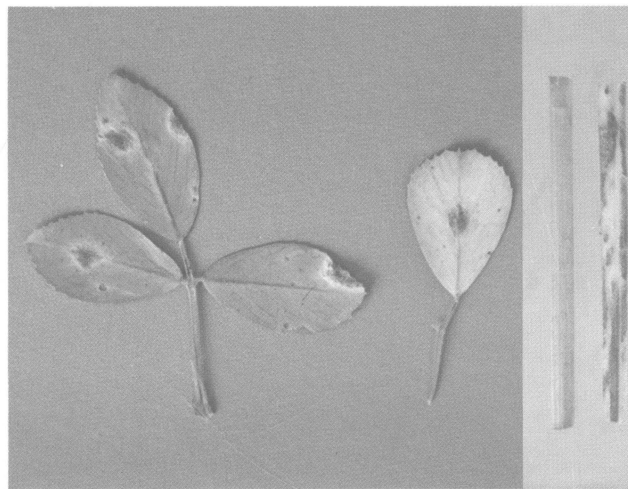
9. Lepto Leaf Spot



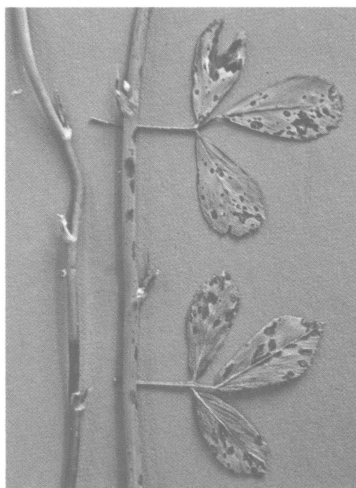
10. Stemphylium Leaf Spot



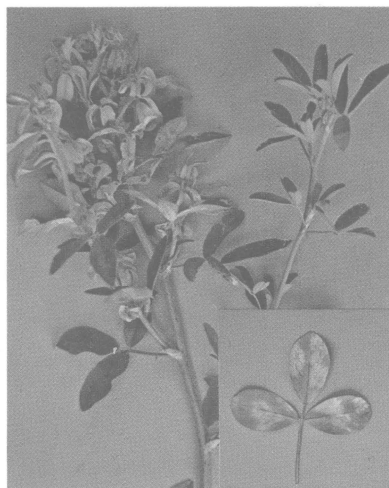
11. Spring Black Stem



12. Summer Black Stem



13. Bacterial Leaf Spot



14. Downy Mildew



15. Alfalfa Mosaic Virus

8. COMMON LEAF SPOT *Pseudopeziza medicaginis*

Small, circular, brown to black spots appear on the leaflets. As the spots become older, a small, raised disc, usually lighter in color, appears in the center of the spot. The infected leaves turn yellow and drop as the disease progresses. This disease occurs wherever alfalfa is grown and develops during moist periods at moderate to cool temperatures.

9. LEPTO LEAF SPOT *Leptosphaerulina briosiana*

Small brown spots on the leaflets, surrounded by a halo, enlarge and acquire a tan center with an irregular brown border. The infected leaves die and cling to the stem for a time. Only young leaves become infected and the greatest damage occurs on young growth after clipping if favorable, moist weather conditions occur at that time. In older growth only the young upper leaves become infected and have typical symptoms and these seldom die.

10. STEMPHYLIUM LEAF SPOT *Stemphylium botryosum*

Spots on the leaflets are oval or irregular and appear sunken. Usually these spots are dark brown with lighter centers and are often surrounded with a pale halo. Older spots are concentrically ringed, resembling a target. A single large lesion can cause a leaf to drop. This disease can cause severe defoliation. It is favored by warm moist weather.

11. SPRING BLACK STEM *Phoma medicaginis*

Dark spots with irregular borders appear on the leaves. They enlarge and merge until much of the leaflet is covered. The leaves turn yellow and drop. Stem lesions are dark green at first, later turning black. Stem lesions may enlarge and merge until most or all of the lower portion of the stem becomes black. Young shoots are often girdled and killed. The disease is favored by cool, moist weather.

12. SUMMER BLACK STEM *Cercospora medicaginis*

Large, usually circular, light gray to black spots appear on the leaves during the summer and early fall. Young spots on the leaves are often surrounded by a halo. Considerable leaf drop results from severe infections. Brown to black lesions appear on the stem. These lesions enlarge and often cover large portions of the stems. The disease is favored by warm, moist weather.

13. BACTERIAL LEAF SPOT *Xanthomonas alfalfae*

Small water-soaked spots on the leaves enlarge, become brown to black, and sometimes have a lighter center. The spots are irregular and more pronounced on the underside of the leaflets. They usually glisten in the light due to the dried exudate. Infected leaves usually drop. Stem lesions are water-soaked at first, later turning brown or black. Seedlings are often killed, especially in summer or early fall seedlings.

14. DOWNY MILDEW *Peronospora trifoliorum*

Light green to yellow blotches appear on the leaves. Terminal portions of the shoots are often dwarfed and the leaves twisted or rolled. A grayish cottony growth, which is the mycelium of the fungus, is often visible on the underside of the leaflets. Cool, moist weather favors the disease.

15. ALFALFA MOSAIC VIRUS

Symptoms of alfalfa mosaic are yellow streaks between the leaf veins or light green to yellow mottling of the leaflets, often accompanied by malformation of the leaflets. Plants are sometimes stunted and may be killed by the virus. Many infected plants show no symptoms. Symptoms are most evident in the spring and fall.



DARK GRAY AREAS — Disease usually occurs annually and affects yield, quality or persistence when susceptible varieties are grown.
LITE GRAY AREAS — Disease occurs but is of minor economic importance except occasionally in local areas.
WHITE AREAS — Disease is usually absent or of little significance.

DEFICIENCIES AND DAMAGE

An Aid To Identification



1. Phosphorus



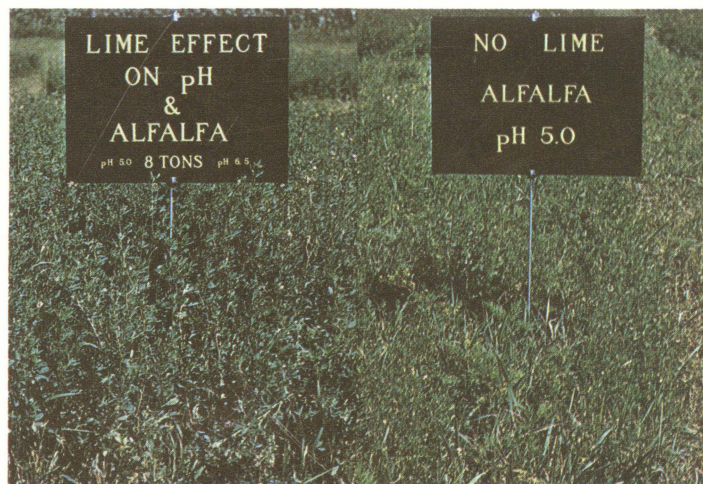
2. Potassium



3. Sulfur



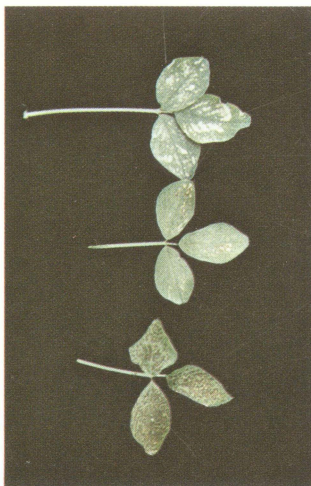
4. Boron



6. Lime



5. Iron



8. Air Pollutant Damage



9. Heaving

1. PHOSPHORUS

Phosphorus deficiency usually does not produce a definite symptom, only a very stunted growth. The stunting of growth and color of the crop will vary with the degree of the deficiency and the soil conditions. Under some soil conditions, low phosphorus produces a stunted bluish-green colored plant while under other conditions, plants appear light yellow as if they were nitrogen or sulfur deficient.

2. POTASSIUM

Potassium can be a major limiting factor for alfalfa production in most high rainfall regions. In areas of generally low rainfall, potassium deficiencies appear less frequently, if at all, except on sandy soils. Symptoms show up first as white spots around the outer edges of the upper leaflets. Under severe deficiency the size and number of the spots increases and the leaves become yellow and dry, causing the lower leaves to drop. Alfalfa stand failure and subsequent takeover by grasses is sometimes an indication of low potassium in soils. Where soil potassium is low, an intensive potassium fertilizer program is necessary to obtain and sustain high yields of alfalfa.

3. SULFUR

Like, phosphorus, sulfur deficiency produces stunting, the degree varying with the severity of the deficiency. Plants appear light yellow because sulfur deficiencies reduce nitrogen fixation. It also influences amino acid and protein production.

4. BORON

Boron deficient alfalfa is sometimes called "yellow top". The symptoms are often confused with leafhopper yellowing. The top leaves are yellow and reddish and bunched and the growing tip may actually die, while the lower leaves and branches remain green. Boron deficient alfalfa does not bloom normally and produces poor seed yields. The deficiency symptoms are most prominent during dry periods, particularly on coarse textured soils. When moisture conditions improve, side branches may often continue growth and extend beyond the main stem.

5. IRON

Iron deficiency symptoms rarely occur. When it occurs, the upper leaves are a bleached yellow color. Iron deficiency usually occurs under conditions which include a soil pH above 7.5, excess carbonates and high moisture conditions.

6. LIME

Alfalfa will not grow well on acid soils. Where lime shortages are a problem, plants are light green, stunted and stands become thin. Aluminum and manganese may be toxic to alfalfa plants on highly acid soils. Adding agricultural limestone reduces their availability and corrects the condition. Increasing the soil pH stimulates nitrogen fixing bacteria in root nodules. It also allows for a greater uptake of magnesium and increases phosphorus availability.

7. ZINC

Symptoms have seldom been observed in the field because of the low zinc requirement of alfalfa. Deficient plants grow slowly and the older leaves become slightly yellowed, followed by progressive necrosis from the top of the plants downward. New leaflets become progressively smaller as they emerge. Deficiency becomes worse as phosphorus availability is increased. The likelihood of deficiency would increase with increasing soil pH.

8. AIR POLLUTANT DAMAGE

Alfalfa is sensitive to high concentrations of smog, sulfur dioxide or ozone in the air. The leaf symptoms are similar for all three. Symptoms range from veinal chlorosis to chlorosis of the entire leaf. Varying degrees of leaf necrosis result from very high concentrations or long periods of exposure. Older leaves are more sensitive than young leaves. Damage usually occurs near urban or industrial areas.

9. HEAVING

Heaving usually occurs on heavy soils high in moisture. Alternate freezing and thawing temperatures cause the wet soil to expand and exert upward pressure on the crown. When the pressure is great enough the root and crown are lifted and the tap root will often break when the base of the root is frozen solid. Heaving can often be severe in late summer or fall seedings because the root systems are short and not well developed.

INSECTS

An Aid To Identification



1. Alfalfa Weevil



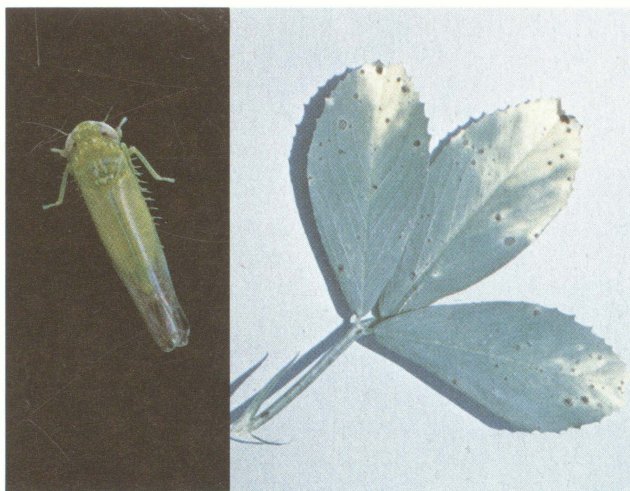
2. Clover Leaf Weevil



3. Clover Root Curculio



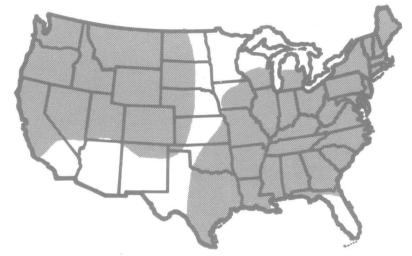
4. Alfalfa Snout Beetle



5. Potato Leafhopper

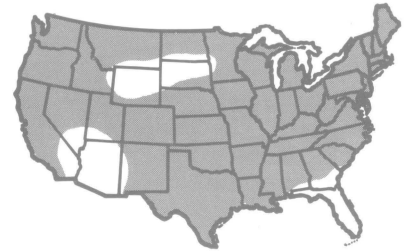
1. ALFALFA WEEVIL, *Hypera postica* (Gyllenhal)

The alfalfa weevil is the most important insect pest of alfalfa in the U.S. Damage from this insect usually starts in early spring when the larvae emerge. The young larvae have black heads and a white stripe down the back. They feed first in the growing tips and then shred the foliage giving infested fields a greyish cast. The adults are about $\frac{1}{4}$ inch long and usually not seen during the day. The pupae may be found in net-like cocoons either on the plants or in debris on the soil. Both larvae and adults are present after the first cutting, feeding on new growth. Remaining larvae soon mature and the new adults leave the fields during the summer, but return in the fall and start depositing eggs.



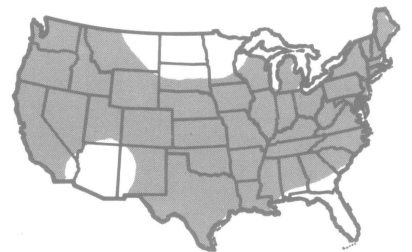
2. CLOVER LEAF WEEVIL, *Hypera punctata* (Fabricius)

The larvae of this insect look very much like alfalfa weevil larvae except that they are larger ($\frac{1}{2}$ inch long) and have brown heads, not black. They are found feeding on alfalfa at night, very early in the spring. They are very susceptible to a fungus disease and diseased, dying or dead larvae curled around the stems are commonly seen. Usually their numbers are reduced by the disease before extensive damage occurs.



3. CLOVER ROOT CURCULIO, *Sitona hispidulus* (Fabr.)

The adult clover root curculio is a small, slender, dark-gray snout beetle about $\frac{3}{16}$ inch long. It feeds on the foliage, but is rarely serious in this stage. However, extensive larval damage to the roots is frequently found, particularly in older stands. Damage is characterized by extensive scarring of the epidermal layers of the roots as pictured. These lesions may become avenues of entrance for various disease pathogens causing wilt and root rot.



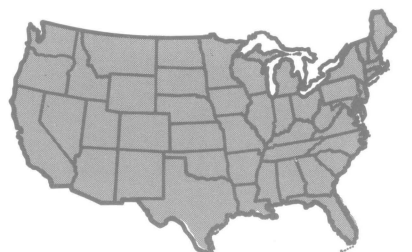
4. ALFALFA SNOUT BEETLE, *Brachyrhinus ligustici* (L.)

This large snout beetle, nearly half an inch long, has been found thus far only in the State of New York. The beetles' spread has been limited because they do not fly. The larvae are large, white, and grub-like in appearance. Damage from adults feeding on the foliage and larvae feeding on or in the roots may be severe enough to kill the plants.



5. POTATO LEAFHOPPER, *Empoasca fabae* (Harris)

This tiny light green insect which jumps when disturbed is a common cause of alfalfa yellowing. The nymph or immature stage is light yellow and characteristically walks sideways. Feeding by these insects causes severe stunting of the plants and yellowing or reddening of the foliage. Leafhopper damage starts in a wedge-shaped area at the tip of the leaf. The first cutting is not usually affected, but subsequent cuttings may be severely damaged.



DARK GRAY AREAS — Insect appears and affects yield or quality of crop.
WHITE AREAS — Insect is usually absent or of little significance.

INSECTS

An Aid To Identification (continued)



6. Pea Aphid



7. Spotted Alfalfa Aphid



8. Meadow Spittlebug



9. Variegated Cutworm



10. Differential Grasshopper



11. Plant Bugs

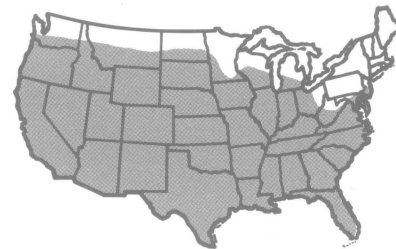
6. PEA APHID, *Acyrtosiphon pisum* (Harris)

This large bright green aphid is common on alfalfa. It builds up huge populations which cover the stems and terminal buds in cool wet seasons. It causes damage by sucking plant juices causing the plants to wilt. Usually as drier and warmer weather develops natural controls reduce the infestations. This insect has many natural enemies.



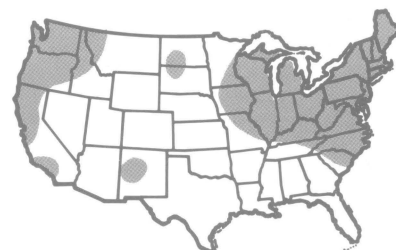
7. SPOTTED ALFALFA APHID, *Therioaphis maculata* (Buckton)

This tiny aphid is light yellowish green or straw colored with rows of dark spots on its back. Unlike the pea aphid, it develops under hot dry conditions. It causes severe stunting and yellowing of plants and will kill seedling stands. It secretes a great abundance of sticky honeydew in which a sooty black fungus may develop. This aphid is most severe in the arid areas of western and southwestern U.S.



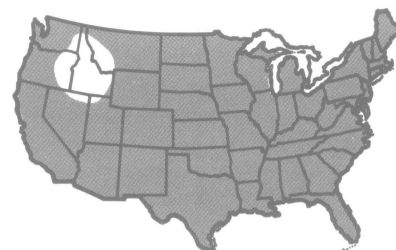
8. MEADOW SPITTLEBUG, *Philaenus spumarius* (L.)

The meadow spittlebug is an early spring pest. The most characteristic symptom of infestation is the frothy spittle secreted by the yellowish green nymphs as they feed. Feeding causes stunting with a shortening of internodes so that the leaves are bunched together giving a rosette appearance. The jumping adults emerge in early June and cause little economic damage to alfalfa, but may be abundant and annoying to the grower at harvest time.



9. VARIEGATED CUTWORM, *Peridroma saucia* (Hubner)

This cutworm perfers non-grass crops and can cause extensive damage to alfalfa during warm wet seasons. When fully grown it is about two inches long and may range in color from almost black to light greenish yellow or tan. It has a distinctive row of light yellow diamond-shaped spots aligned down the middle of the back. The worms feed mainly at night and hide under clods or in soil debris during the day. There are also other species of cutworms which occasionally damage alfalfa.



10. DIFFERENTIAL GRASSHOPPER, *Melanopus differentialis* (Thomas)

The differential grasshopper is only one of several species of grasshoppers which may attack alfalfa and cause serious damage. Grasshoppers become most numerous in uncultivated areas. Consequently, heaviest infestations are usually found in field margins, fence rows, pastures, grass waterways, etc. Their populations increase in seasons which are hot and dry. New seedlings of alfalfa are favorite foods of grasshoppers. From field margins grasshoppers will move into these new seedlings, depleting them as they feed.



11. PLANT BUGS

There are several species of plant bugs which are common in alfalfa fields. The tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois) which is the one pictured, is one of the most common in the Midwest and eastern states. Plant bugs cause serious damage to seed and are not usually thought of as forage pests. However, they suck the juices from the foliage and are frequently very abundant, resulting in wilting of the plant tips and thus forage yield loss.



DARK GRAY AREAS — Insect appears and affects yield or quality of crop.
WHITE AREAS — Insect is usually absent or of little significance.

